

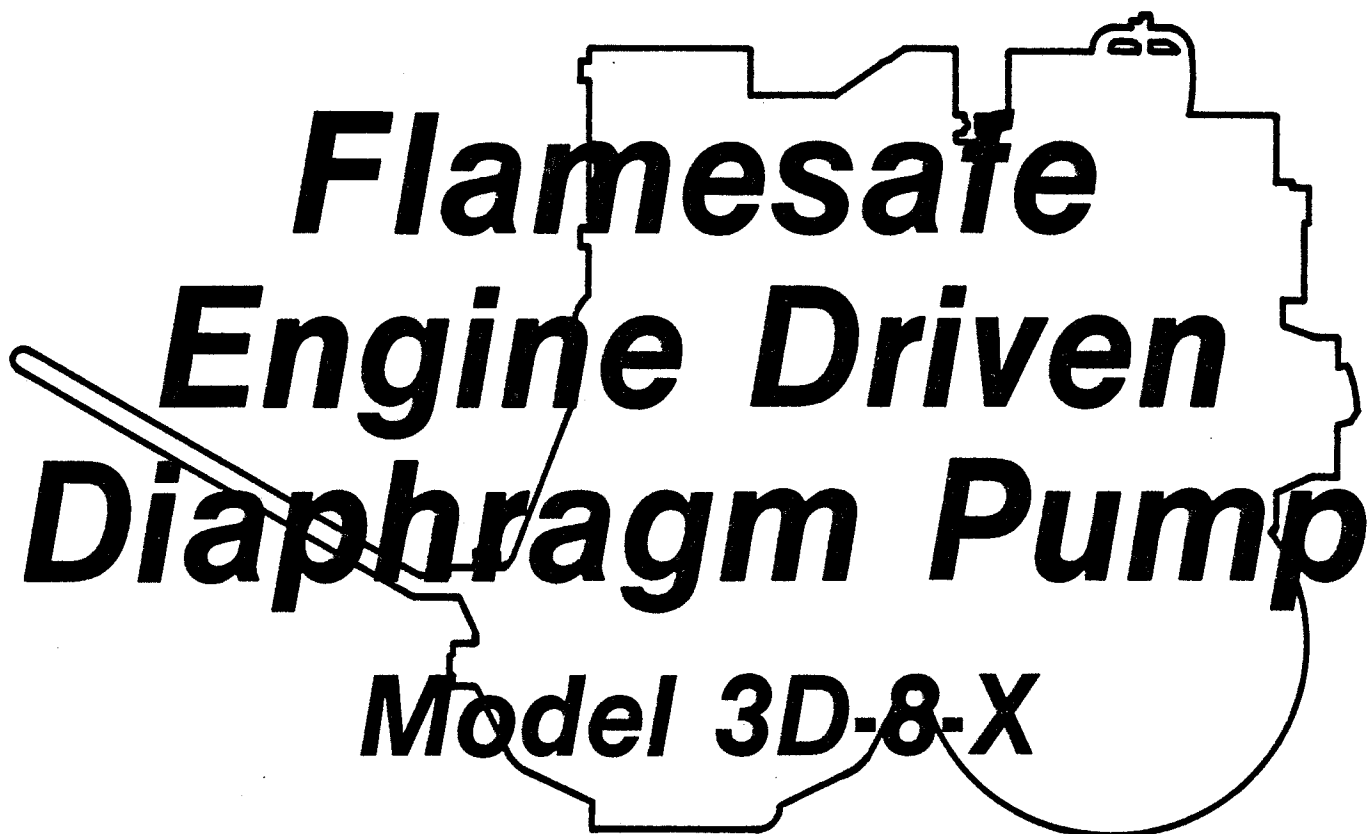
INSTALLATION, OPERATION, PARTS LIST,  
AND MAINTENANCE MANUAL

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A C D



April 1, 1981

A large, stylized outline of a diaphragm pump, showing the main body and a handle on the left side. The text is overlaid on this outline.

***Flamesafe  
Engine Driven  
Diaphragm Pump  
Model 3D-8-X***

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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## INTRODUCTION

This Installation, Operation, and Maintenance Manual is designed specifically to help you get the best performance and longest life from your Gorman-Rupp diaphragm pump. The engine of this pump has been modified at the Gorman-Rupp factory to include special Flamesafe features.

If you have any questions regarding the pump or the modification which are not covered in this manual or in other literature furnished with the unit, please contact your Gorman-Rupp distributor, or write:

The Gorman-Rupp Company  
P.O. Box 1217  
Mansfield, Ohio 44902

or  
Gorman-Rupp of Canada Limited  
70 Burwell Road  
St. Thomas, Ontario N5P 3R7

For information or technical assistance on the engine, contact the local dealer or representative of the engine manufacturer.

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

### NOTE

Instructions to aid in installation, operation, or maintenance, or which clarify a procedure.

### CAUTION

Instructions which must be followed to avoid causing damage to the product or other equipment incidental to the installation. These describe the procedure required and the damage which could result from failure to follow the procedure.

### WARNING

Instructions which must be followed to avoid causing injury or death to personnel. These describe the procedure required and the injury which could result from failure to follow the procedure.

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## WARNINGS

### THESE WARNINGS APPLY TO FLAMESAFE ENGINE DRIVEN DIAPHRAGM PUMPS.

The engine used in this pump is not standard. It has been modified at the Gorman-Rupp factory for Flamesafe operation, and cannot be further modified without affecting performance and safety factors. The Flamesafe modifications must be inspected and maintained regularly while the unit is in use.

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect the spark plug to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.
4. Close all connecting valves, and drain the pump.

This pump is designed to pump only non-flammable liquids. Do not attempt to pump volatile or corrosive liquids, or liquids which may attack pump fittings or components.

Overheated pumps can cause severe burns and injury. If overheating of the pump casing occurs:

1. Stop the pump immediately.
2. Allow the pump to cool.
3. Refer to instructions in this manual before restarting the pump.

Do not attempt to disengage any parts of an overheated pump unit. Vapor pressure within the volute casing can eject these parts with great force when they are disengaged. Allow the pump to cool before servicing it.



Never run this pump backwards. Be certain that rotation is correct before fully engaging the pump.

When operating this pump, make certain that the discharge throttling valve is open. If this pump is operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump to rupture.

Do not operate the pump without the eccentric guard assembly in place. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless and odorless.

Fuel used by internal combustion engines presents an extreme explosion and fire hazard. Make certain that all fuel lines are securely connected and free of leaks. Never refuel a hot or running engine. Avoid overfilling the fuel tank. Always use the correct type of fuel.

The engine governor setting is critical for efficient pump operation. See the recommended governor setting in OPERATION.

## INSTALLATION

Pump installations are seldom identical. This section summarizes recommended installation practice relative to inspection, pump positioning, and suction and discharge piping. For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

### Preinstallation Inspection

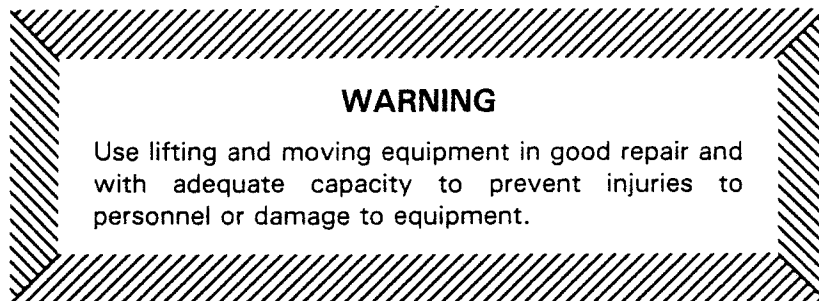
The pump assembly was inspected and tested before it was shipped from the factory. Before installation, check the pump for damage which may have occurred during shipment. Check as follows:

- a. Inspect the pump assembly for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose bolts, nuts, capscrews, and other attaching hardware.
- c. Carefully read all tags, decals, and markings on the pump assembly, and follow the instructions indicated.
- d. Check all lubricant levels and lubricate as necessary (see LUBRICATION in MAINTENANCE AND REPAIR).

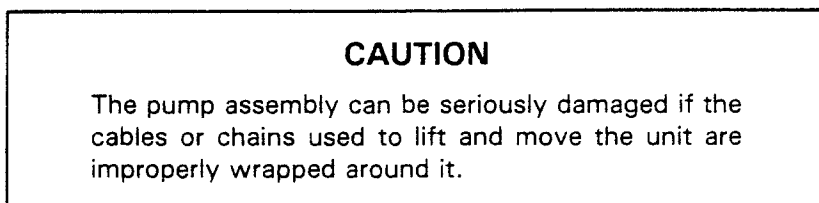
### Positioning the Pump

Locate the pump as close as possible to the liquid to be pumped. Level mounting is essential for proper operation. Block the wheels to prevent creeping.

### Lifting



Make sure that hoists and other lifting equipment are of sufficient capacity to safely handle the pump assembly. If chains or cables are used, make certain that they are positioned so that they will not damage the pump, and so that the load will be balanced.





## Suction and Discharge Piping

### CAUTION

If this pump is mounted in a system with rigid piping, a flexible joint should be installed at the suction and discharge flanges to minimize vibration.

### Materials

Either pipe or hose may be used for suction and discharge lines, but hose used in suction lines must be the rigid-wall, reinforced type to prevent collapse under suction. Using pipe couplings in suction lines is not recommended.

### Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

### Connections to Pump

Never pull a pipe line into place by tightening flanges or couplings. Connections must be aligned exactly with the pump port. Lines near the pump must be independently supported to avoid strain on the pump which could cause serious vibration, decreased bearing life, and increased shaft and seal wear. Hose-type lines should have supports strong enough to secure the line when it is filled with liquid and under pressure.

### Gauges

If discharge pressure and vacuum suction gauges are desired, drill and tap the suction and discharge lines close to the pump before installing the lines.

## SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

### Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

### Strainers

If a strainer is used with this pump, clean the strainer regularly during operation.



**Sealing**

All threaded connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift. After installation, inspect the suction line carefully for potential leaks.

**DISCHARGE LINES**

**Throttling Valves**

With high discharge heads, install a throttling valve in the discharge line to protect the pump from excessive shock pressure and reverse rotation when the pump is stopped. Use a valve as large as the largest pipe in the line to minimize friction losses. Never install a throttling valve in the suction line.

**Check Valves**

This pump is provided with integral suction and discharge check valves.

**Siphoning**

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action could result, causing damage to the pump.

**Suction Line Positioning**

The depth of submergence of the suction line is critical to efficient pump operation. Figure 1 shows recommended minimum submergence vs. velocity.

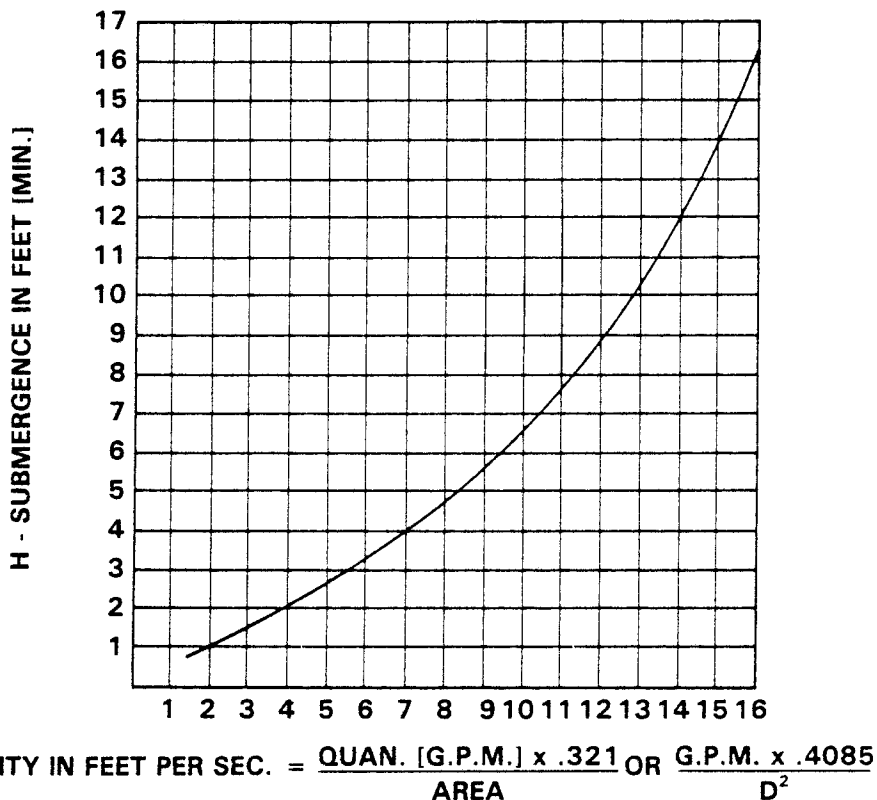


Figure 1. Recommended Minimum Suction Line Submergence Vs. Velocity

## ALIGNMENT

The pump, gearbox, and engine were aligned and secured at the factory, but fastening hardware may have been loosened during shipment. Check alignment before starting the pump.

### WARNING

Before checking alignment, remove the spark plug, or take other precautions to ensure that the pump will remain inoperative.

Alignment adjustments may be made by loosening the securing hardware, and shifting the pump and/or engine, or by shimming as required.

### WARNING

Do not operate the pump without the eccentric guard in place and secured. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

## OPERATION

### WARNING

Do not attempt to pump volatile or corrosive materials for which this pump has not been designed. Do not operate the pump in an explosive atmosphere.

The particular service in which this pump is used will affect pump performance, especially discharge velocities. Consult the Gorman-Rupp factory for actual performance levels of this pump.

Consult the manuals furnished with the pump engine unit before starting the pump.

### CAUTION

Set the engine governor at 2600 RPM **maximum**. Operation at higher governor settings can cause pump components to deteriorate.

### WARNING

Never run this pump backwards. Be certain that rotation is correct before fully engaging the pump.

Open all valves and start the engine. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop the engine and check the suction line for leaks.

If the discharge line is fitted with a throttling valve, partially close the valve to guard against excessive shock pressure after the pump has been primed. When the discharge line is completely filled, adjust the throttling valve to the required discharge flow rate.

**WARNING**

When operating this pump, make certain that the discharge throttling valve is open. If this pump is operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump to rupture.

Check the pump for unusual noises or excessive vibration while it is operating.

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Overheating can occur if the valves in the discharge or suction lines are closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture. If overheating occurs, stop the pump and allow it to cool before servicing it.

**WARNING**

Do not attempt to disengage any parts of an overheated pump unit. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing it.

If a strainer is used, check it regularly during pump operation, or if the flow rate begins to drop, and clean it as necessary. Be especially alert for unusual noises when pumping liquids containing solids.

After stopping the pump, disconnect the spark plug to ensure that the engine will remain inoperative.

In below freezing conditions, drain the water from the pump and the hoses when the pump is not in operation. Also, clean out any solids by flushing with a hose.

If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, flush it with clean water.

## TROUBLESHOOTING

### WARNING

Before attempting to open or service the pump:

1. Consult pump service manual.
2. Disconnect the spark plug to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.

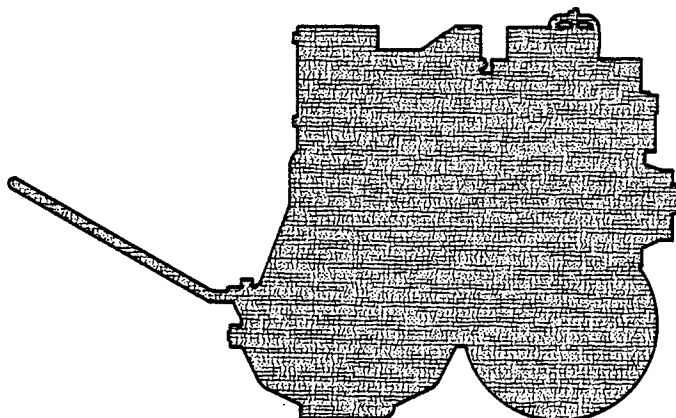
Trouble	Possible Cause	Probable Remedy
PUMP FAILS TO PRIME	<p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Suction valve clogged, binding, or not seating properly.</p> <p>Cracked or broken diaphragm.</p> <p>Diaphragm not securely in place.</p> <p>Strainer clogged.</p>	<p>Correct leak.</p> <p>Replace suction hose.</p> <p>Clean suction valve. Check that suction flange nuts are tight.</p> <p>Replace diaphragm.</p> <p>Tighten diaphragm.</p> <p>Clean strainer.</p>
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	<p>Air leak in suction line.</p> <p>Suction intake not properly submerged.</p> <p>Strainer clogged.</p> <p>Lining of suction hose collapsed.</p> <p>Driven speed too slow.</p> <p>Cracked or broken diaphragm.</p>	<p>Correct leak.</p> <p>Check installation.</p> <p>Clean strainer.</p> <p>Replace suction hose.</p> <p>Operate engine at maximum governed speed.</p> <p>Replace diaphragm.</p>



Trouble	Possible Cause	Probable Remedy
<p>PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont)</p>	<p>Diaphragm not securely tightened.</p> <p>Suction lift or discharge head too high.</p> <p>Suction or discharge check valve clogged, binding, or not seating properly.</p>	<p>Tighten diaphragm.</p> <p>Check installation and correct as required.</p> <p>Clean valves. Check that suction and discharge flange nuts are tight.</p>
<p>PUMP REQUIRES TOO MUCH POWER</p>	<p>Liquid solution too thick.</p> <p>Discharge check valve clogged or binding.</p> <p>Pump speed too high.</p>	<p>Dilute if possible.</p> <p>Clean valve.</p> <p>Reduce drive unit speed.</p>
<p>PUMP CLOGS FREQUENTLY</p>	<p>Discharge flow too slow.</p> <p>Suction or discharge check valve clogged, binding, or not seating properly.</p>	<p>If throttling valve used in discharge line, open valve fully to increase flow rate, and run drive unit at maximum governed speed.</p> <p>Clean valves. Check that suction and discharge flange nuts are tight.</p>
<p>EXCESSIVE NOISE</p>	<p>Pump or engine unit not securely mounted.</p> <p>Pumping entrained air.</p>	<p>Check and tighten mounting bolts.</p> <p>Locate and eliminate source of air bubble.</p>

# ***Flamesafe Engine Driven Diaphragm Pump***

## ***Model 3D-8-X***



MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING EFFICIENCY.

# SECTIONAL DRAWING

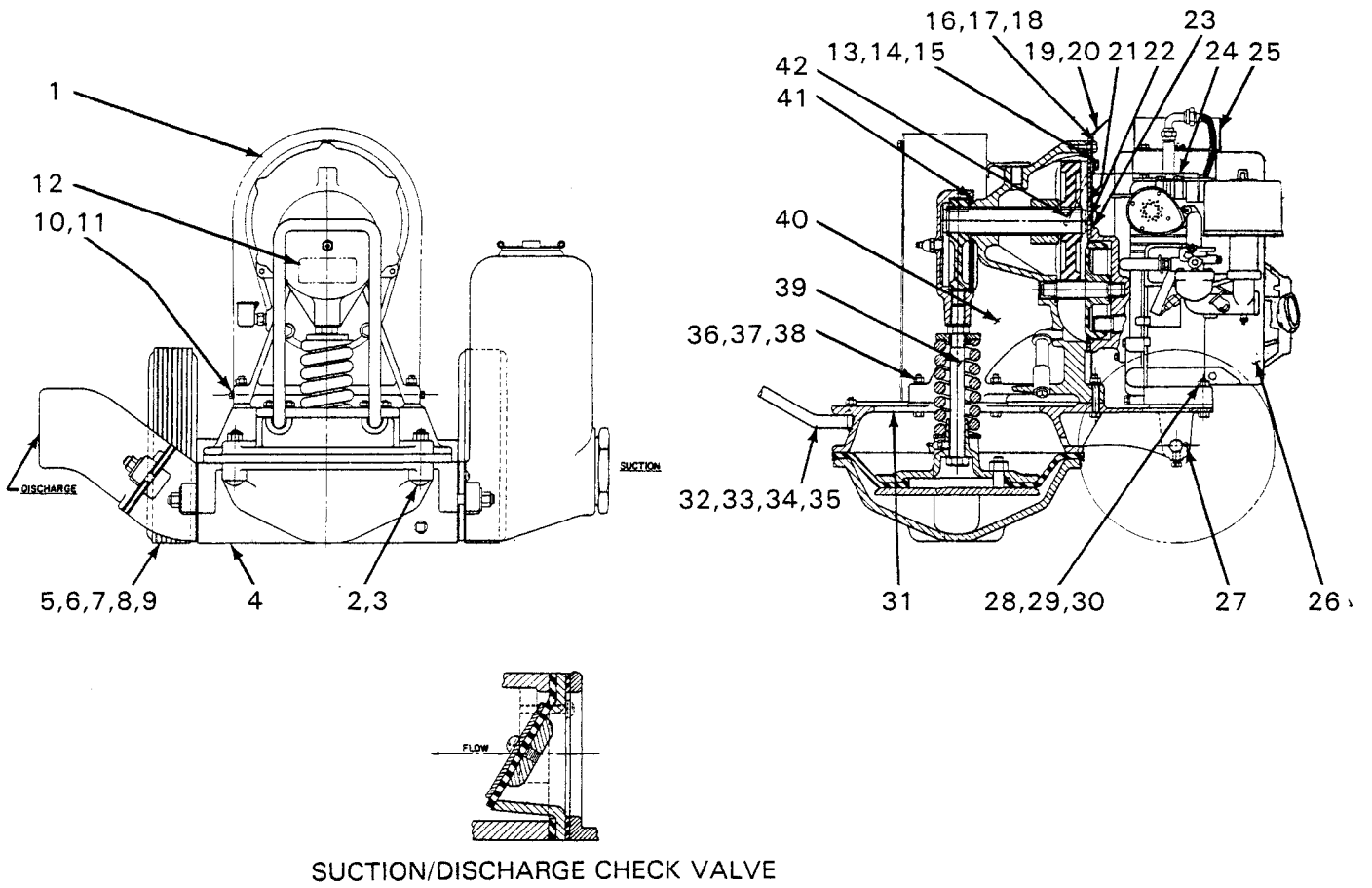


Figure 1. Pump Model 3D-8-X



**PARTS LIST****PUMP MODEL 3D-8-X**

(From S/N 716711 up)

Above Serial Numbers Do Not Apply To Pumps Made In Canada.

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	ECCENTRIC GUARD ASSEMBLY	42381-030	—	1
2	HEX NUT	D-08	15991	4
3	FLAT WASHER	K-08	15991	4
4	DIAPHRAGM POT ASSY (see figure 2)	46475-703	—	1
5	PIPE	5657	15070	2
6	SQUARE HEAD SETSCREW	G-0604	15990	2
7	SPACER WASHER	5382	15990	7
8	AXLE	5645	15990	1
9	★ PNEU TIRE	S-0752	—	2
10	HEX HEAD CAPSCREW	B-0402	15991	4
11	LOCKWASHER	J-04	15991	4
12	LUBE DECAL	38816-085	—	1
13	HEX HEAD CAPSCREW	B-0403	15991	1
14	LOCKWASHER	J-04	15991	1
15	HEX NUT	D-04	15991	1
16	HEX HEAD CAPSCREW	B-0403	15991	7
17	LOCKWASHER	J-04	15991	9
18	HEX HEAD CAPSCREW	B-0407	15991	2
19	ENGINE SHIELD	34748-001	—	1
20	ENGINE SHIELD	34748-002	—	1
21	★ HOUSING GASKET	5367-G	20050	1
22	COVER PLATE	5396	15990	1
23	★ GASKET	S-0825	—	1
24	MUFFLER GUARD	34741-005	—	1
25	FILL CAP GUARD ASSEMBLY	42381-023	—	1
26	B&S 8 I/C ENGINE	29112-051	—	1
27	★ COTTER PIN	M-0306	15990	2
28	HEX HEAD CAPSCREW	B-0507	15991	2
29	HEX NUT	D-05	15991	2
30	LOCKWASHER	J-05	15991	2
31	DIAPHRAGM RING	5379	13010	1
32	DRAW BAR	5438	15990	1
33	U-BOLT	5495	15990	2
34	HEX NUT	D-06	15991	4
35	LOCKWASHER	J-06	15991	4
36	HEX HEAD CAPSCREW	B-0608	15991	5
37	HEX NUT	D-06	15991	5
38	LOCKWASHER	J-06	15991	5
39	PLUNGER ROD ASSEMBLY (see figure 3)	5685-B	—	1
40	GEARBOX ASSEMBLY (see figure 4)	44161-007	—	1
41	★ SNAP RING	5385	00000	1
42	GROUND WIRE ASSEMBLY	13830	—	1
NOT SHOWN:				
	NAME PLATE	2613-BP	13990	1
	STRAINER	9026	24000	1
OPTIONAL:				
	STATIONARY BASE	8105	24000	1

★ INDICATES PARTS RECOMMENDED FOR STOCK

# SECTIONAL DRAWING

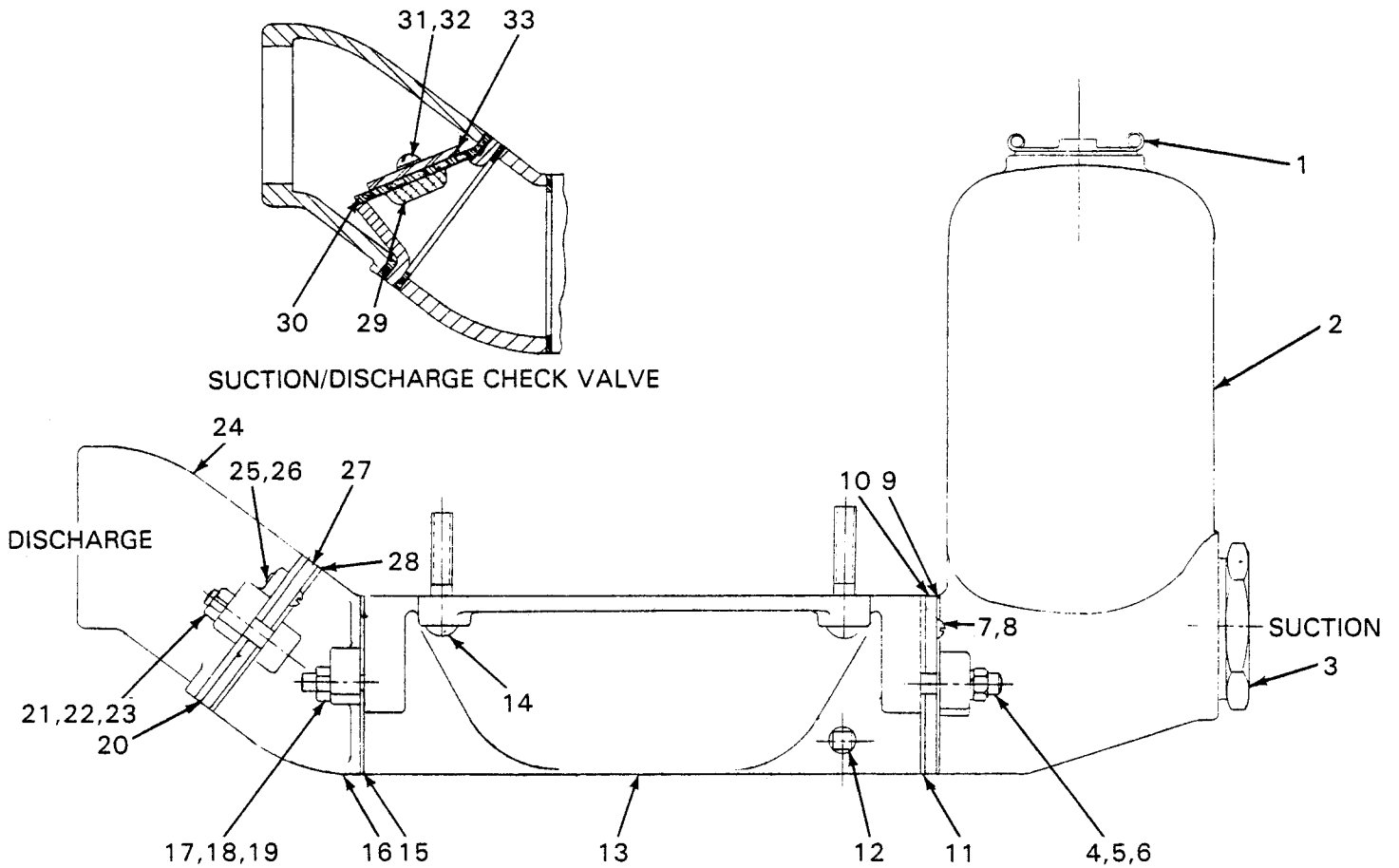


Figure 2. 46475-703 Diaphragm Pot Assembly



## PARTS LIST

### 46475-703 DIAPHRAGM POT ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	PLUG AND GASKET	S-0591	—	1
2	SUCTION STUB	5376	13010	1
3	REDUCER PIPE BUSHING	AP-4832	11990	1
4	STUD	C-0810	15991	2
5	HEX NUT	D-08	15991	2
6	LOCKWASHER	K-07	15991	2
7	ROUND HEAD MACHINE SCREW	X-0404	15991	2
8	LOCKWASHER	J-04	15991	2
9	★ SUCTION STUB GASKET	5374-GA	19140	1
10	SUCTION VALVE SEAT	5374	10010	1
11	★ SUCTION VALVE ASSEMBLY	46413-027	—	1
12	DRAIN PLUG	P-06	11990	1
13	DIAPHRAGM POT	5375	13010	1
14	RIB MACHINE BOLT	BJ-0811	15990	4
15	★ INBOARD DISCHARGE FLANGE GASKET	5374-GA	19140	1
16	INBOARD DISCHARGE FLANGE	5377	13040	1
17	STUD	C-0809	15991	2
18	HEX NUT	D-08	15991	2
19	FLAT WASHER	K-07	15991	2
20	★ DISCHARGE VALVE ASSEMBLY	46413-027	—	1
21	STUD	C-0810	15991	2
22	HEX NUT	D-08	15991	2
23	WASHER	11273	15990	2
24	OUTBOARD DISCHARGE FLANGE	5658	13040	1
25	ROUND HEAD MACHINE SCREW	X-0403	15991	2
26	LOCKWASHER	J-04	15991	2
27	DISCHARGE VALVE SEAT	5374	10010	1
28	★ OUTBOARD DISCHARGE FLANGE GSKT	5374-GA	19140	1
29	★ VALVE WEIGHT	5426	13010	2
30	★ CHECK VALVE	5427-A	19140	2
31	LOCKWASHER	J-04	17000	4
32	ROUND HEAD MACHINE SCREW	X-0403	17000	4
33	★ VALVE WEIGHT	5428	15990	2

★ INDICATES PARTS RECOMMENDED FOR STOCK

# SECTIONAL DRAWING

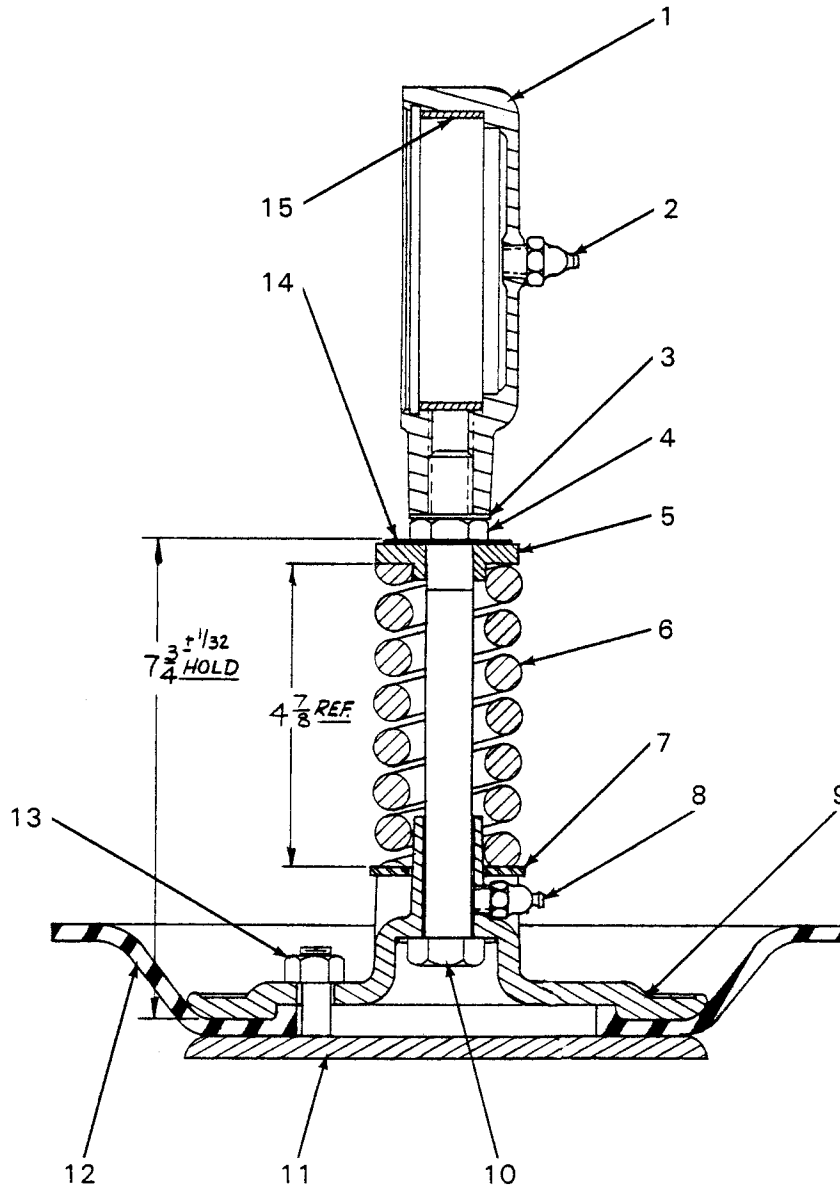


Figure 3. 5685-B Plunger Rod Assembly



## PARTS LIST

### 5685-B PLUNGER ROD ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	ECCENTRIC CAP	5373	13010	1
2	LUBE FITTING	S-0191	—	1
3	T-TYPE LOCKWASHER	AK-12	15990	1
4	JAM NUT	AT-12	15990	1
5	SPRING WASHER	5384	15990	1
6	★ SPRING	5398	16080	1
7	FLAT WASHER	K-20	15991	1
8	LUBE FITTING	S-0191	—	1
9	UPPER DIAPHRAGM PLATE	5381	10010	1
10	PLUNGER ROD	5383	15990	1
11	LOWER DIAPHRAGM PLATE	5394	—	1
12	★ DIAPHRAGM	S-1042	—	1
13	HEX NUT	D-08	—	3
14	★ ADJUSTING SHIM	11840-B	15990	4
15	★ ECCENTRIC BEARING	5610	14000	1

★ INDICATES PARTS RECOMMENDED FOR STOCK

# SECTIONAL DRAWING

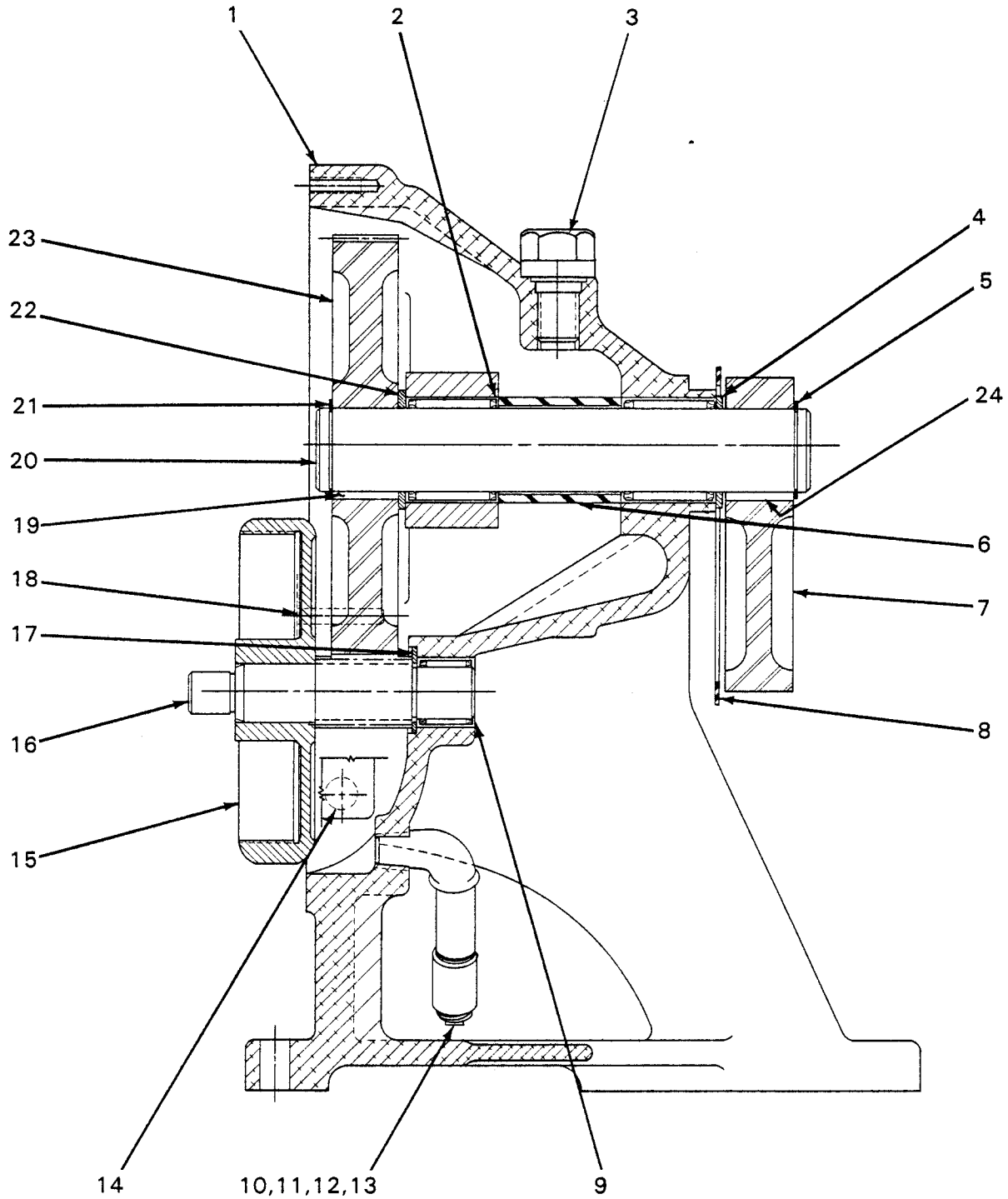


Figure 4. 44161-007 Gearbox Assembly



## PARTS LIST

### 44161-007 GEARBOX ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	GEARBOX HOUSING	5367	13010	1
2	★ BEARING	S-0702	—	2
3	HEX HEAD CAPSCREW	B-1004	15991	1
4	★ CAM SHIM SET	13103-A	15990	1
5	★ CAM SNAP RING	S-0700	—	1
6	SPACER SLEEVE	S-0952	—	1
7	ECCENTRIC CAM	5378-A	10080	1
8	CAM WASHER	6531	18040	1
9	★ PINION SHAFT BEARING	S-0703	—	1
10	DRAIN PLUG	P-04	11990	1
11	PIPE COUPLING	AE-04	11990	1
12	PIPE NIPPLE	T-0408	15070	1
13	STREET ELBOW	RS-04	11990	1
14	OIL CUP	S-0617	—	1
15	★ PINION GEAR	S-0823	—	1
16	★ PINION SHAFT	5333	16020	1
17	SPACER WASHER	5382	15990	1
18	DOWEL PIN	AA-0405	15990	2
19	★ CAM SHAFT GEAR KEY	31811-040	—	1
20	★ CAM SHAFT	5397	15020	1
21	★ CAM SHAFT GEAR SNAP RING	S-0700	—	1
22	SPACER WASHER	5395	15990	1
23	★ CAM SHAFT GEAR	5334	16060	1
24	★ CAM KEY	31811-040	—	1

★ INDICATES PARTS RECOMMENDED FOR STOCK

# SECTIONAL DRAWING

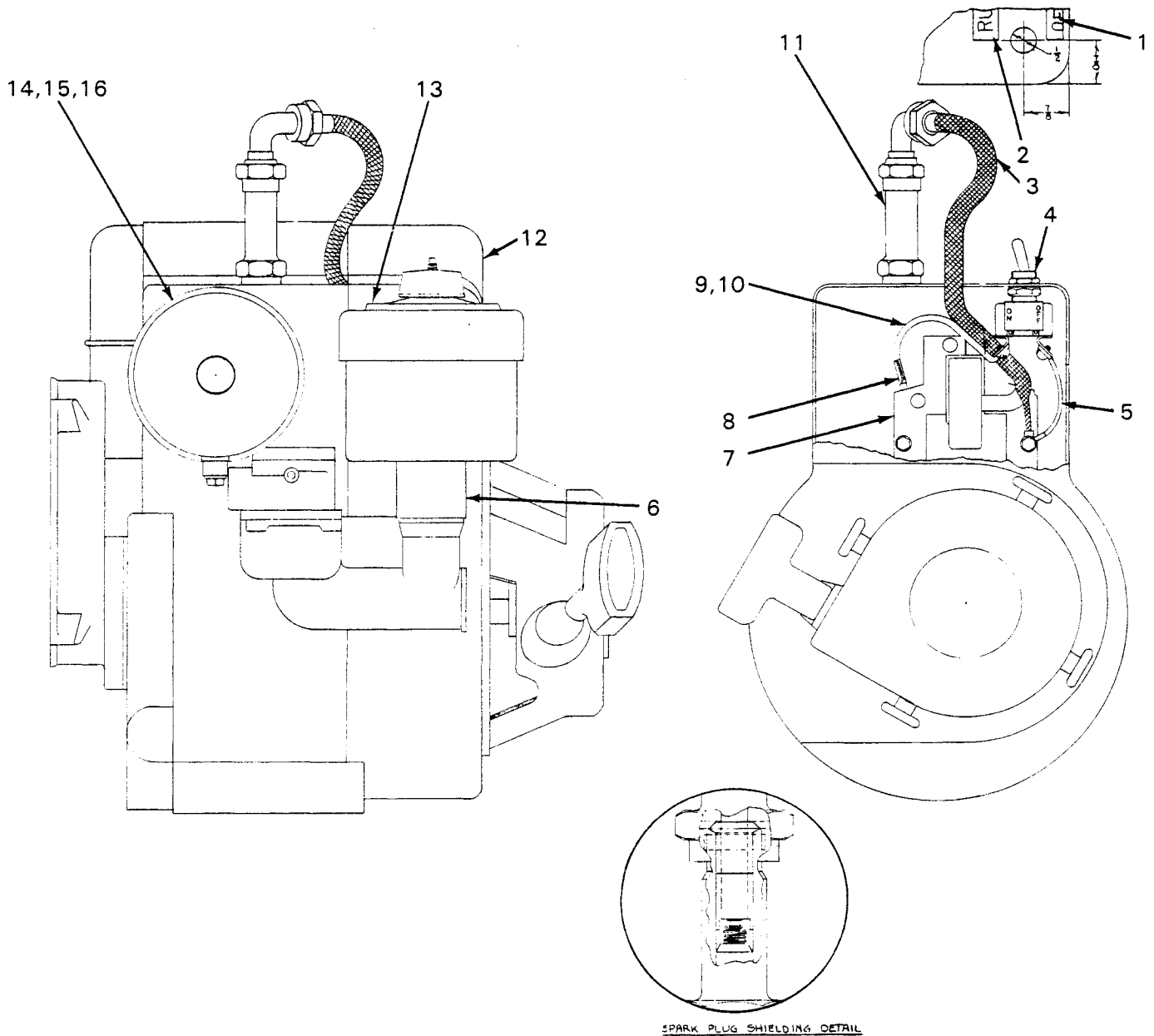


Figure 5. GRP41-13 Modified B&S 8 I/C Engine





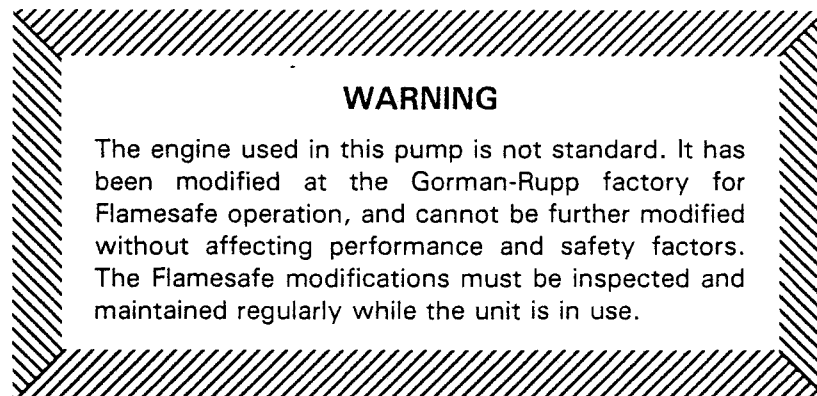
## PARTS LIST

### GRP41-13 MODIFIED B&S 8 I/C ENGINE

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	INSTRUCTION STICKER	38815-009	—	1
2	INSTRUCTION STICKER	38816-034	—	1
3	SPARK PLUG KIT	S-1810	—	1
4	TOGGLE SWITCH	S-1961	—	1
5	GROUND WIRE ASSEMBLY	47311-052	—	1
6	GASKET	29172-041	—	1
7	IGNITION COIL	29172-141	—	1
8	INSULATION SLEEVE	31411-017	—	1
9	WIRE	38748-004	—	1
10	TERMINAL	S-2067	—	1
11	SHIELDED SPARK PLUG	S-1809	—	1
12	*B&S 8 I/C ENGINE	29112-051	—	1
13	AIR CLEANER	S-1811	—	1
14	MUFFLER	29334-202	—	1
15	PIPE COUPLING	AE-08	11990	1
16	PIPE NIPPLE	T-08	15070	1

\*This is a standard B&S engine without Flamesafe modification.

This pump requires little service due to its rugged, minimum-maintenance design. If it becomes necessary to inspect or replace components in and adjacent to the rotating assembly, however, follow these instructions, which are keyed to the sectional views (see figures 1, 2, 3, 4, and 5) and the accompanying parts lists.



#### **PUMP DISASSEMBLY (See figure 1)**

Close all connecting valves, and drain the pump by removing the diaphragm pot assembly drain plug. Clean and reinstall the drain plug.

To remove the eccentric guard assembly (1), remove the hex head capscrews (10) and lockwashers (20) securing the eccentric guard to the gearbox assembly.

To remove the diaphragm pot assembly (4), remove the hex nuts (2) and flat washers (3) securing the diaphragm pot to the diaphragm ring (31).

To remove the plunger rod assembly (39), disengage the snap ring (41) securing the assembly.

To remove the gearbox assembly (40), remove the hex head capscrews (36), hex nuts (37), and lockwashers (38), securing the assembly to the diaphragm ring.

#### **Diaphragm Pot Disassembly (See figure 2)**

To remove the suction stub (2), remove the hex nuts (5) and lockwashers (6) securing the stub to the diaphragm pot.

To remove the suction check valve assembly (11), remove the round head machine screws (7) and lockwashers (8) securing the assembly.

To remove the inboard discharge flange (16), remove the hex nuts (18) and flat washers (19) securing the flange to the diaphragm pot.

To remove the outboard discharge flange (24), remove the hex nuts (22) and washers (23) securing the flange to the inboard discharge flange.

To remove the discharge check valve assembly (20), remove the round head machine screws (25) and lockwashers (26) securing the assembly.

#### **Plunger Rod Disassembly (See figure 3)**

To remove the diaphragm (12), remove the hex nuts (13) securing the lower diaphragm plate (11) to the upper diaphragm plate (9).

To remove the upper diaphragm plate, flat washer (7), spring (6), spring washer (5), adjusting shims (14), jam nut (4), and T-lockwasher (3), disengage the plunger rod (10) from the eccentric cap (1).

The eccentric bearing (15) is a press fit in the eccentric cap.

#### **Gearbox Disassembly (See figure 4)**

Drain the gearbox by removing the gearbox drain plug (10). Clean and reinstall the drain plug.

Disengage the pinion shaft (16) from the eccentric cam shaft gear (23), and remove the pinion shaft together with the pinion gear (15), and spacer washer (17). Force the pinion shaft bearing (9) out of the gearbox housing bore.

Remove the eccentric cam snap ring (5), and remove the eccentric cam (7), cam key (24), cam washer (8), and cam shims (4).

For maximum pump efficiency, there should be an end play of .002 to .010 inch between the eccentric cam and the gearbox housing. Measure this end play, and add or remove eccentric cam shims as required.

#### **Plunger Rod Reassembly (See figure 3)**

Clean the plunger rod, the eccentric bearing, and the bearing cap with a soft cloth soaked in cleaning solvent.

Inspect the eccentric bearing, and replace as necessary. Install the bearing in the eccentric cap.

Position the upper diaphragm plate, flat washer, spring, spring washer, adjusting shims, jam nut, and T-lockwasher on the plunger rod, and install the plunger rod in the eccentric cap. Tighten the jam nut until snug against the T-lockwasher.

For maximum pump efficiency, the distance between the top of the adjusting shims and the bottom of the upper diaphragm plate should measure 7-3/4 inches, plus or minus 1/32 inch (see figure 4). Measure this distance, and add or remove adjusting shims as required.

Inspect the diaphragm, and replace it if cracked or badly worn. Position the diaphragm on the lower diaphragm plate, and secure the lower plate to the upper diaphragm plate.



### **Diaphragm Pot Reassembly (See figure 2)**

Replace the inboard discharge flange gasket (15), and secure the flange to the diaphragm pot.

Inspect the discharge check valve assembly, and replace as necessary. Install the valve seat (27), and secure the valve assembly.

Replace the outboard discharge flange gasket (28), and secure the flange to the inboard discharge flange.

Inspect the suction check valve assembly, and replace as necessary. Install the valve seat (10), and secure the valve assembly.

Replace the suction stub gasket (9), and secure the suction stub to the diaphragm pot.

### **Pump Reassembly (See figure 1)**

Secure the gearbox assembly to the diaphragm ring.

Position the eccentric cap over the eccentric cam, and install the snap ring securing the plunger rod assembly.

Secure the diaphragm pot assembly to the diaphragm ring, making certain that the outer lip of the diaphragm seats evenly between the pot and the ring.

Secure the eccentric guard assembly to the gearbox assembly.

## **PUMP OPERATION**

Open all connecting valves.

Remove the suction stub plug and gasket (1, figure 2), and fill the suction stub. Clean and reinstall the suction stub plug and gasket.

Check that all piping is secure.

See LUBRICATION before starting the pump.

## **LUBRICATION**

### **Plunger Rod Assembly**

Apply No. 2 lithium base pressure gun grease through the plunger rod lube fittings (2 and 8, figure 3).

### **Gearbox**

Fill the bearing housing through the gearbox oil cup (14, figure 4) with a good grade of SAE No. 20-30 non-detergent motor oil until the oil level reaches the midpoint of the oil cup sight gauge.



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